Cockpit Presentation of Weather Information for General Aviation Airplanes

NASA Aviation Safety and Security Program

Weather Accident Prevention Project Review

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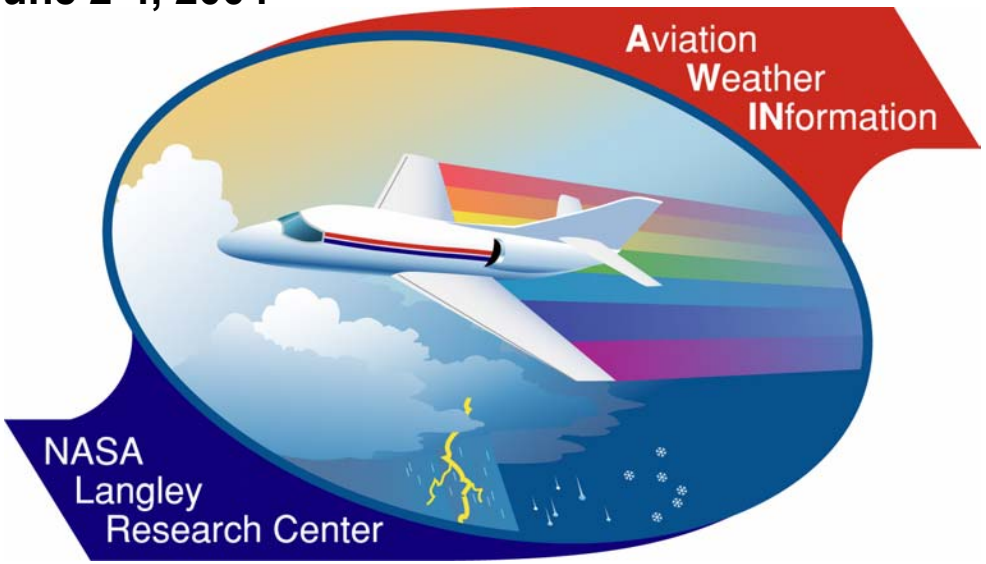


Outline

- Pilot Decision Making
- Automated Decision Aiding
- NEXRAD Resolution
- Training Components

Pilot Decision Making

RTI - Burgess & Montoya / KSU - Thomas

Objective

Determine effect of

- NEXRAD looping
- National Convective Weather Forecast (NCWF)

Approach

- Piloted simulation
- IFR flight
- Convective weather encounters
- Two decision points

RTI Cockpit Research Facility

Aviation Weather Information

Results

- Both increased weather situation awareness
- Neither provided complete understanding of how to avoid weather hazards
- Benefits were offset by failure to collaborate
- Displays played a role in decision making at both points
- Results unable to establish unequivocally
  - –Minor or major role of weather display
  - –Superiority of NEXRAD looping or NCWF
- Autopilot may be needed in high workload situations

Guidance

for FAA AIM & ACs

- Should maintain awareness of age of displayed information to integrate with information from other sources
- Should not use as a replacement for approved navigation procedures and equipment
- Should develop training program

Recommendations

For future experiments

- **Include the ability to correlate access to the display with**
  - **pilot interactions**
  - **airplane position data**
- **Use an oculometer**
- **Improve cockpit camera system**

Automated Decision Aiding

RTI / NASA Langley

Objective

Determine effect of

- Automated Decision Aiding (ADA)
- Situational Weather Product Classification and Selection (SWPCS)
- Weather Service Frequency Prompting (WSFP)

on

- Pilot situation awareness
- Aeronautical decision making
- Collaborative decision making
- Pilot workload

Automated Decision Aiding

Approach

- Piloted simulation
- IFR flight
- Convective weather encounters
- Rockwell AWARE system

Status

- 60 subject pilots
- Data collection completed May 2004

NEXRAD Resolution

FAA CAMI - Beringer & Ball

Objective

Determine effects of

- **NEXRAD Graphical Data Resolution**
- **Direct Weather Viewing**

on

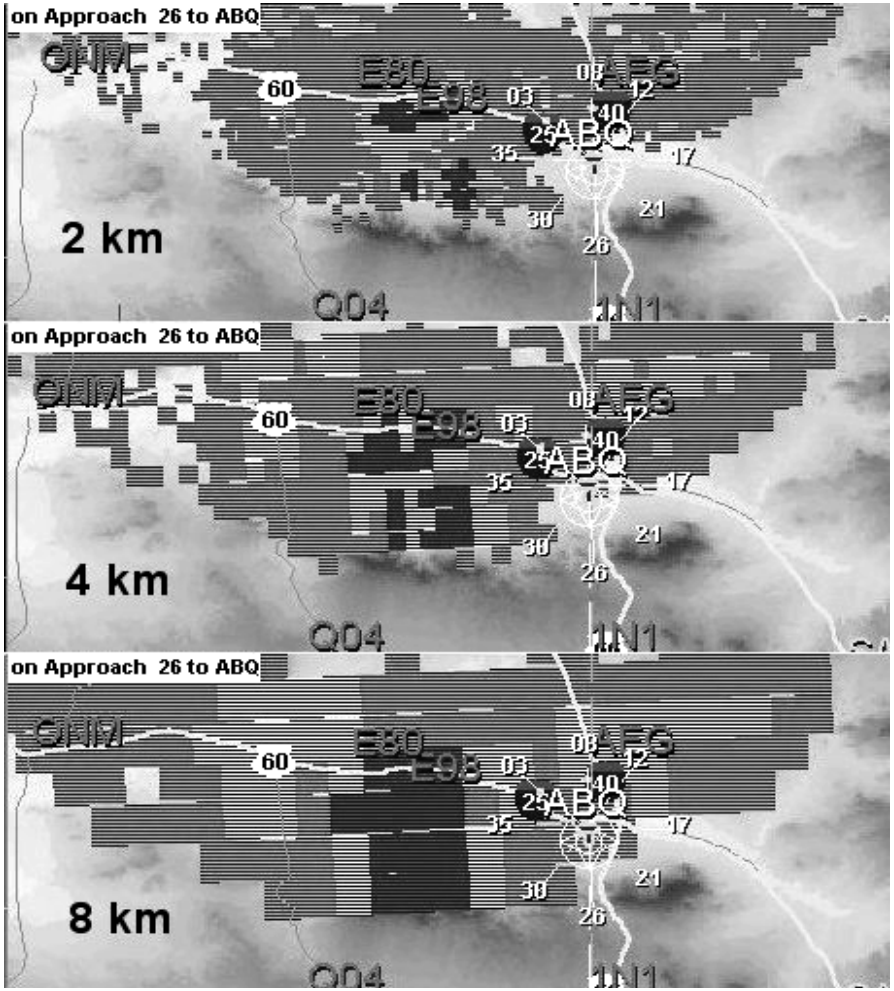
- **Pilot judgment of weather severity**
- **Willingness to continue flight**

Advanced GA Research Simulator

Aviation Weather Information

NEXRAD Resolution

Aviation Weather Information

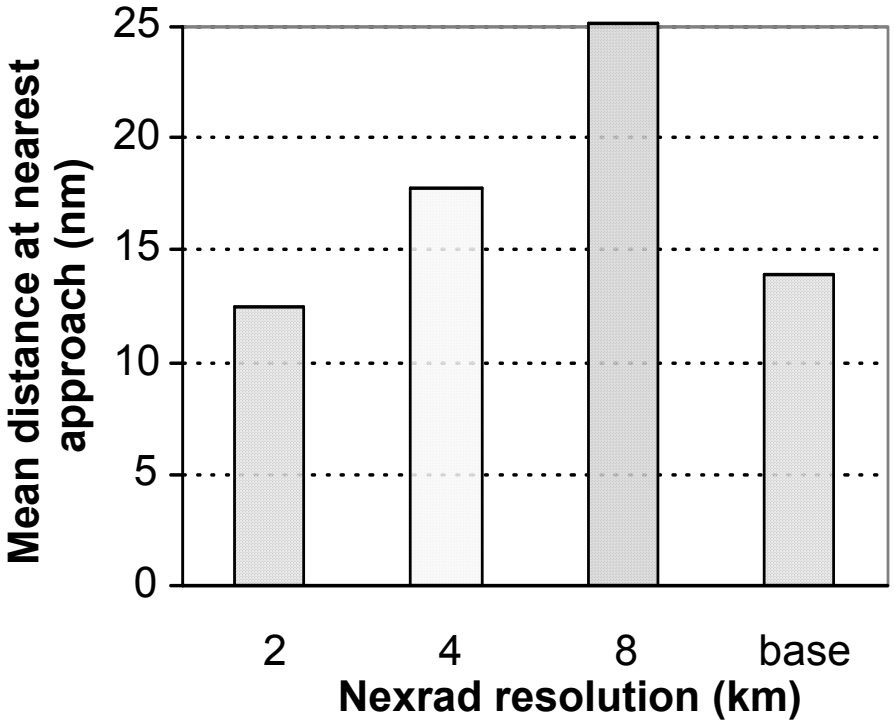


Display Usage

Resolution	Usage	
	Strategic	Tactical
2 km	4	4
4 km	4	4
8 km	8	0

Distance from Storms vs Resolution

Aviation Weather Information



Post Experiment Slide Study

Aviation Weather Information

Pilots viewed series of slides approaching convective activity and were asked to decide at what point they would divert viewing each condition

For all conditions

8 km - diverted earliest

4 km - diverted slightly later

2 km - diverted latest

Base group approximated 2 km group

Training Component Experiment

Aviation Weather Information

FAA CAMI - Beringer, McAdaragh & Stubblefield

Objective

Determine if pilots who are encouraged to use cockpit weather information (as per AIM) will

- **Make better weather-related decisions**
- **Experience lower workload**
- **Have greater situational awareness**

Approach

- **Review RTI simulation experiments**
- **Identify training components for hazardous weather avoidance collaborative decision-making**
- **Conduct flight simulation**

Experiment Design

Two groups of pilots

Independent variable

- Presence/absence of guidance on appropriate use of cockpit weather display

Dependent variables

- Aeronautical decision making (ADM)
- Workload
- Situation awareness

Status: Data Collection Under Way

Summary

Completed experiments on:

- **Pilot Decision Making**
- **Automated Decision Aiding**
- **NEXRAD Resolution**

Conducting experiment to address training effects